

# Annex A

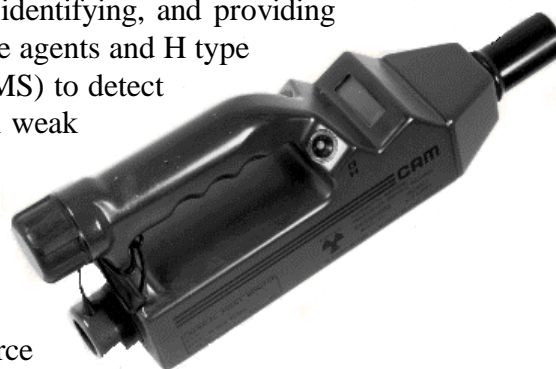
## Contamination Avoidance Programs

### SECTION 1: FIELDED AND PRODUCTION ITEMS

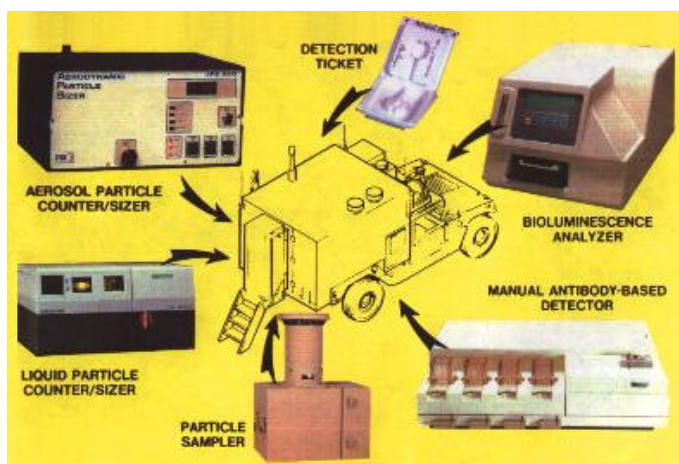
#### DETECTORS AND MONITORS

##### Chemical Agent Monitor (CAM) and Improved Chemical Agent Monitor (ICAM)

The CAM is a hand held instrument capable of detecting, identifying, and providing relative vapor concentration readouts for G and V type nerve agents and H type blister agents. The CAM uses ion mobility spectrometry (IMS) to detect and identify agents within one minute of agent exposure. A weak radioactive source ionizes air drawn into the system, and the CAM then measures the speed of the ions' movement. Agent identification is based on characteristic ion mobility and relative concentrations based on the number of ions detected. The four pound, 15" long CAM can be powered either by an internal battery or by an external source through the CAM's combination power/fault diagnosis plug. The CAM may be used for a variety of missions, to include area reconnaissance and area surveillance, and monitoring of decontamination operations. The improved ICAM significantly reduces the level and frequency of maintenance without affecting performance. The ICAM sieve pack has double the capacity of the two CAM sieve packs, which results in twice the operational life of the ICAM over the CAM. This fielding will significantly reduce operating and sustainment costs associated with the CAM.



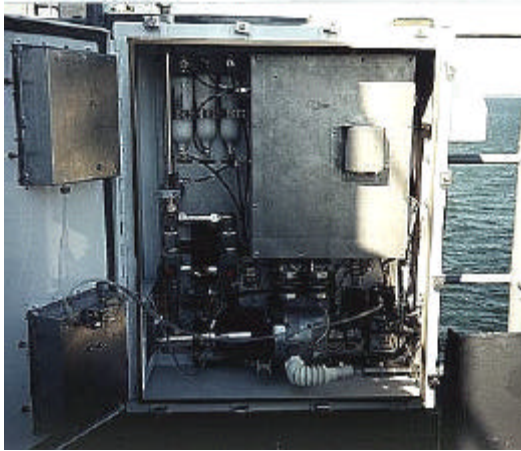
##### M31 Biological Integrated Detection System (BIDS) NDI



BIDS uses a multiple technology approach, both developmental and off-the-shelf materiel, to detect biological agents with maximum accuracy. BIDS is a vehicle-mounted, fully integrated biological detection system. The system, which is a collectively-protected, HMMWV-mounted S788 shelter, is modular to allow component replacement and exploitation of "leap ahead" technologies. The system is capable of detecting and presumptively identifying four BW agents simultaneously in less than 45 minutes. Thirty-eight BIDS (NDI versions) were

fielded to the 310th Chemical Company (U.S. Reserve) during FY96. This gives the Department of Defense its first credible, rapidly deployable biological detection capability. The BIDS is a Corps level asset. The BIDS program includes a P<sup>3</sup>I development effort which will increase automation and integrate the CB Mass Spectrometer (CBMS) with the Biological Detector as sub-components. Each sub-component may also be used as stand-alone systems to meet other service needs.

### **Interim Biological Agent Detector (IBAD) -Rapid Prototype**

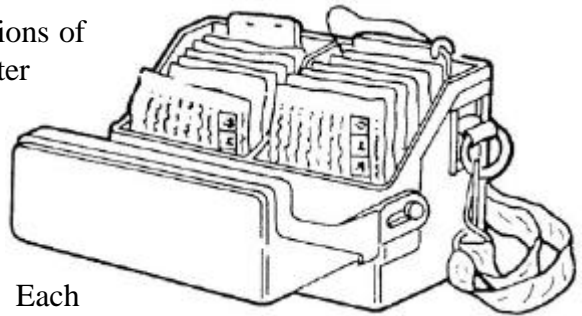


IBAD provides a near term solution to a deficiency in shipboard detection of biological warfare agents. IBAD consists of a particle sizer/counter, wet wall cyclone particle sampler, and hand held colorimetric, immunochemical assay tickets for identification of suspect aerosol particles (through hand-held assay). IBAD is capable of detecting an increase in the particulate background, which may indicate a man-made biological attack is underway, and sampling the air for identification analysis. IBAD can detect a change in background within 15 minutes, and can identify biological agents within an additional 30 minutes. It is

a rapid prototype system that started service with the fleet in FY96. Twenty IBAD systems are currently fielded. These systems will be among ship platforms as dictated by fleet priorities.

### **M256A1 Chemical Agent Detector Kit**

The M256A1 kit can detect and identify field concentrations of nerve agents (sarin, tabun, soman, GF, and VX), blister agents (mustard, phosgene oxime, mustard-lewisite, and lewisite), and blood agents (hydrogen cyanide and cyanogen chloride) in about 15–20 minutes. The kit consists of a carrying case containing twelve individually wrapped detector tickets, a book of M8 chemical agent detector paper, and a set of instructions. Each



detector ticket has pretreated test spots and glass ampoules containing chemical reagents. In use, the glass ampoules are crushed to release a reagent, which runs down pre-formed channels to the appropriate test spots. The presence or absence of chemical agents is indicated through specific color changes on the test spots. The kit may be used to determine when it is safe to unmask, to locate and identify chemical hazards (reconnaissance), and to monitor decontamination effectiveness.

### ABC-M8 VGH, and M9 Chemical Agent Detector Paper

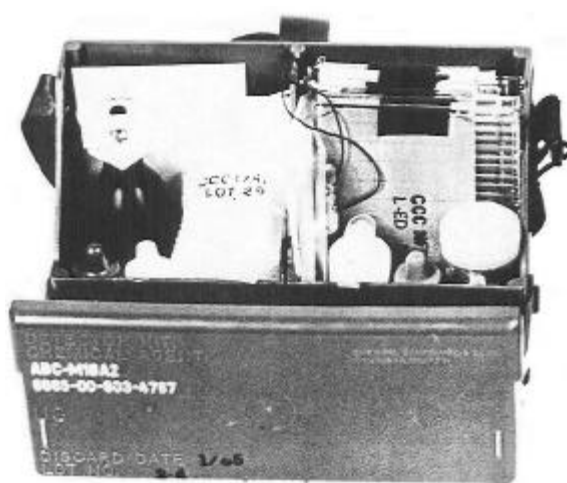
M8 and M9 paper are dye impregnated papers that change color when exposed to liquid chemical agent. These papers cannot detect chemical agents in vapor form. M8 paper comes in 4" by 2 1/2" booklets. Each booklet contains 25 sheets of detector paper that are capable of detecting G series



nerve agents (sarin, tabun, soman, and GF), V type nerve agents, and H (mustard) type blister agents. M8 paper can identify agents through distinctive color changes from its original off-white: yellow-orange for G, blue-green for V, and red for H. M8 paper is typically used to identify unknown liquid droplets during chemical reconnaissance/ surveillance missions. M9 paper is issued as a 33 foot long, adhesive backed strip that is rolled into a 3" x 2-1/3" roll. M9 paper can detect G and V nerve agents, and H blister agents. It cannot distinguish the identity of agents. It turns red, red-purple, or red-brown when in contact with liquid chemical nerve and blister agents. M9 paper is typically placed on the BDO, equipment, and vehicle exteriors to warn personnel of the presence of a liquid chemical agent.

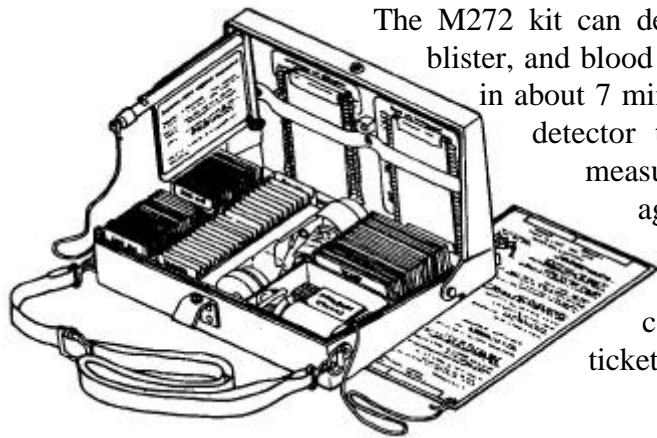
### M18A2 Chemical Agent Detector Kit

The M18A2 can detect and identify dangerous concentrations of nerve agents (sarin, tabun, soman, GF, and VX), blister agents (mustards, phosgene oxime, mustard-lewisite mixture, phenyl dichlorarsine (PD), ethyl dichlorarsine (ED), and methyl dichlorarsine (MD)), blood agents (hydrogen cyanide and cyanogen chloride), and choking agents (phosgene) in about 1–4 minutes. The kit is also used to confirm results of the M256A1 kit. The M18A2 kit contains a squeeze bulb and enough detector tubes, detector tickets, and chemical reagents needed to conduct 25 tests for each agent vapor. The kit also contains a booklet of M8 chemical agent detector paper to detect liquid agents. Agent vapor detection is indicated by the production of a specific color change in the detector tubes. The M18A2 kit was fielded in 1982 and only used by special teams such as surety teams or technical escort personnel.





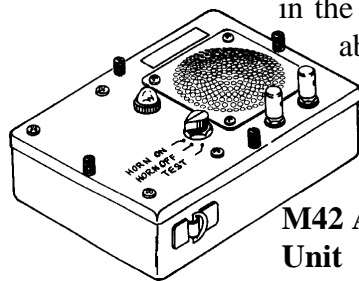
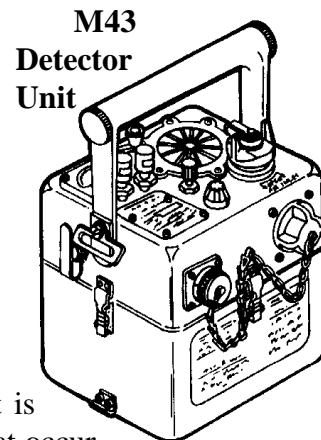
### M272 Water Test Kit



The M272 kit can detect and identify hazardous levels of nerve, blister, and blood agents in treated or untreated water resources in about 7 minutes. The kit contains enough detector tubes, detector tickets, a test bottle, and pre-packed, pre-measured test reagents to conduct 25 tests for each agent. The kit also contains simulants used for training. Agent detection in water is indicated by the production of a specific color change in the detector tubes or in the ticket. The M272 was fielded in 1984.

### M8A1 Automatic Chemical Agent Alarm (ACAA)

The M8A1 ACAA is a system that continuously samples the air to detect the presence of dangerous concentrations of G and V type nerve agent vapors. The M8A1 ACAA may be employed in a number of configurations, but all configurations are built around the M43A1 detector unit and the M42 alarm unit. The configurations differ primarily in their mountings and power supplies: ground mounted and battery operated, or mounted on a vehicle and powered by the vehicle's electrical system. The M43A1 detector unit measures 6 1/2" x 5 1/2" x 11" with the battery used in ground mounted operations adding another 7 3/4" in height. The M43A1 detector unit uses a radio-isotope to ionize molecules in the air that is pumped through the system, then detects electrical current changes that occur



**M42 Alarm Unit**

in the presence of nerve agents. The M43A1 detector unit will alarm within about 1-2 minutes from exposure to agent. The M42 alarm unit is a remote visual and audible alarm that measures 7" x 4" x 2 1/3". The M42 alarm unit may be placed up to 400 meters from the M43A1 detector unit to give users warning of an approaching agent cloud.

### M-90 Automatic Agent Detector (AMAD)

The AMAD is an automatic nerve and mustard agent detector that detects agents in vapor form. This system is currently in use by the Air Force. It transmits an alarm by radio to a central alarm unit.



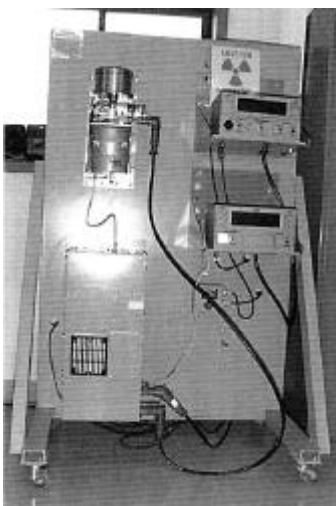
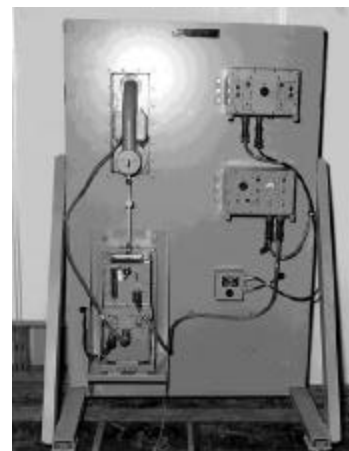


### **Automatic Liquid Agent Detector (ALAD)**

The ALAD is a liquid agent detector that can detect droplets of GD, VX, HD, and L as well as thickened agents. It transmits its alarm by field wire to a central alarm unit. Although the remote transmission is useful, the device only detects droplets of liquid agents. It must be used in conjunction with other point or standoff vapor agent detectors to afford a complete detection capability.

### **Chemical Agent Point Detection System (CAPDS), MK21, MOD1**

This is a fixed system capable of detecting nerve agents in vapor form, using a simple baffle tube ionization spectrometer. Installed in a ship's upper superstructure level, CAPDS obtains a sample of external air, ionizes airborne vapor molecules, and collects them on a charged plate after eliminating lighter molecules via the baffle structure. When a sufficient mass of ions is collected, a pre-set potential is achieved, and an alarm signal is generated and sent to both Damage Control Central and the bridge. The system has been installed on essentially all surface ships.



### **Improved (Chemical Agent) Point Detection System (IPDS) - Production**

The IPDS is a new shipboard point detector and alarm that replaces the existing shipboard CAPDS. IPDS uses special elongated ion mobility cells to achieve the resolution necessary to counter false alarms caused by interferent vapors. IPDS can detect nerve and blister agent vapors at low levels, and automatically provide an alarm to the ship. The unit is built to survive the harsh sea environment and the extreme electromagnetic effects found on Navy ships.

### **M22 Automatic Chemical Agent Detection Alarm (ACADA)**

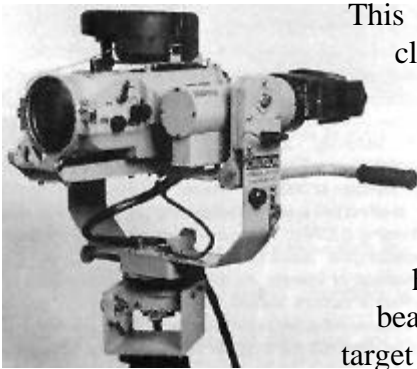
ACADA is a man-portable, point sampling alarm system that provides significant improvement over current capabilities; it detects and identifies all nerve agents, mustard, and lewisite, by class. ACADA provides concurrent nerve and blister agent detection, improved sensitivity and response time, agent identification capability, improved interference rejection, extensive built-in test, a data communications interface, and the capability to be programmed for new threat agents. It replaces



the M8A1 Alarm as an automatic point detector and augments the CAM as a survey instrument. The ACADA consists of an off-the-shelf non-developmental item (NDI)—the GID-3 chemical agent alarm. A shipboard version of the ACADA is being built to address the unique interferents found aboard Navy ships that cause false alarms on the NDI ACADA. The shipboard version of ACADA will serve to cover the Navy's emergency requirements until the Joint Chemical Agent Detector can be fielded.

## STAND-OFF DETECTION AND REMOTE/EARLY WARNING

### AN/KAS-1/1A Chemical Warfare Directional Detector (CWDD)



This is a semi-portable system designed to detect nerve agent vapor clouds at ranges up to five kilometers. The AN/KAS-1/1A must be removed from its stowage case and set up on a pre-installed pedestal for operation. A trained, diligent operator must manually aim the detector at the suspect cloud and interpret its infrared images to determine whether or not the cloud contains nerve agent vapors. The AN/KAS-1A provides a remote video display, an enhanced capability for vapor cloud analysis, and a remote relative bearing indicator useful for avoiding the agent cloud or other surface target with a thermal signature.

### M21 Remote Sensing Chemical Agent Alarm (RSCAAL)

The M21 RSCAAL is an automatic scanning, passive infrared sensor that detects nerve (GA, GB, and GD) and blister (H and L) agent vapor clouds based on changes on the infrared spectrum caused by the agent cloud. It is effective at line-of-sight distances of up to five kilometers. The alarm is used for surveillance and reconnaissance missions in both vehicle-mounted and tripod-mounted modes.



### Long Range Biological Stand-off Detector System (LRBSDS) - NDI



LRBSDS utilizes elastic backscatter and infrared light detection and ranging (IR-LIDAR) technology to detect, range, and track particulate clouds that are indicative of a BW attack; the LR-BSDS cannot discriminate biological from non-biological clouds. The system, which is approximately 1,240 pounds and 2.3 cubic meters, has three major components: a pulsed laser transmitter operating at IR wavelengths; a receiver and telescope; and an information processor and display. The system is mounted on a UH 60 Blackhawk



helicopter for operations. This program has been designed in two phases; an NDI phase designed to rapidly field an interim capability and a pre-planned product improvement (P3I) phase. The three NDI LR-BSDSs have been fielded to the 310<sup>th</sup> Chemical Company (USAR). The NDI system is able to detect and track man-made aerosols out to 30 km, but is non-eyesafe out to about 2.5 km. The P3I will provide an eye safe laser system at all ranges, an automated cloud detection and tracking capability, and an increased detection range (50 km).

## NBC RECONNAISSANCE

### M93 NBC Reconnaissance System (NBCRS)

The M93 NBC Reconnaissance System, known as the FOX, is a high mobility armored vehicle capable of performing NBC reconnaissance on primary, secondary, and cross country routes throughout the battlefield. The NBCRS was procured as a Non-Developmental Item and is capable of detection, warning and sampling the effects of NBC weapons and is used as a reconnaissance vehicle to locate, identify and mark chemical and nuclear contamination on the battlefield. The M93 FOX usually accompanies the scouts or motorized reconnaissance forces when performing its NBC mission. The



NBCRS has an overpressure filtration system that permits the crew to operate the system in a shirt sleeve environment which is fully protected from the effects of NBC agents and contamination. It utilizes a secure communications system to warn follow-on forces. Samples gathered are forwarded to the Theatre Area Medical Laboratory for further analysis and verification. The mobility platform is a six wheeled all wheel drive, armored combat vehicle capable of cross-country operation at speeds up to 65 MPH. The Fox System is fully amphibious and is capable of swimming speeds up to 6 MPH. The M93 NBCRS has been fielded worldwide to the Army and Marine Corps forces.

### M93A1 – FOX System



The Block I Modification–M93A1 NBCRS contains an enhanced and fully integrated NBC sensor suite consisting of the M21 RSCAAL, MM1 Mobile Mass Spectrometer, CAM/ICAM, AN/VDR-2, and M22 ACADA. The NBC sensor suite has been digitally linked together with the communications and navigation subsystems by a dual-purpose central processor system known as the MICAD. The MICAD processor fully automates NBC Warning and Reporting functions and provides the crew commander full situational awareness of the Fox's NBC sensors, navigation, and communications systems.

The M93A1 FOX is also equipped with an advanced position navigation system (GPS & ANAV) that enables the system to accurately locate and report agent contamination. The NDI mobility

platform is a six wheeled, all wheel drive armored vehicle capable of cross-country operation at speeds up to 65 MPH. The Fox System is also fully amphibious and is capable of swimming at speeds up to 6 MPH. It is used as a reconnaissance vehicle to locate, identify, and mark chemical and biological agents on the battlefield. The FOX usually accompanies the scouts or motorized reconnaissance forces when performing its NBC mission.

## RADIACS

### AN/VDR-2



The AN/VDR-2 measures gamma dose rates from 0.01  $\mu\text{Gy/hr}$  (micro-Grays per hour) to 100 Gy/hr and beta dose rates from 0.01  $\mu\text{Gy/hr}$  to 5 cGy/hr. The unit functions simultaneously as a dose rate meter and dose meter with independent adjustable alarms that can be set at any level over the entire range. Dosage data is independently stored in non-

destructive memory for display on command and may be retained when the unit is turned off. The unit is powered by three 9 volt batteries.

### AN/PDR-75 Radiac Set

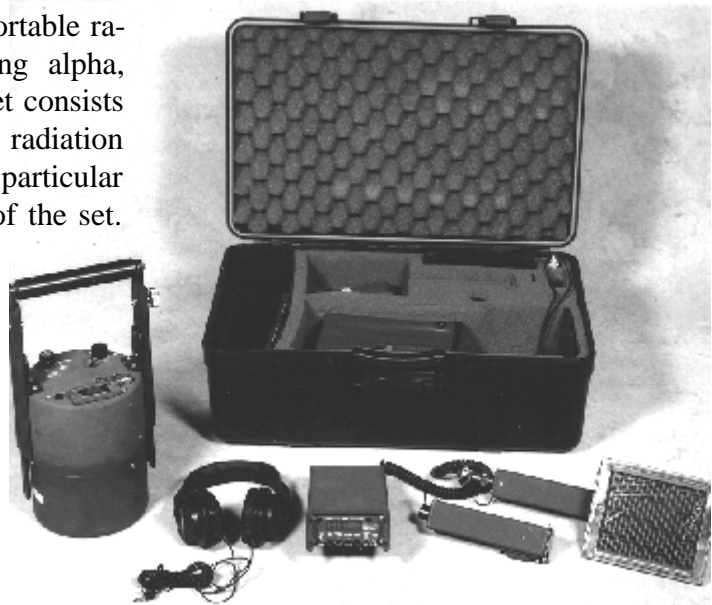
The AN/PDR-75 measures dose from 0 to 999 cGy (centi-Gray). The Radiac Set consists of a dosimeter and a reader. It provides the capability to monitor and record the exposure of individual personnel to gamma and neutron radiation. Each individual will be issued a DT-236/PDR-75 dosimeter. This device, worn on the wrist, contains a neutron diode and a phosphate glass gamma detector. When a determination of exposure is required, the dosimeter is inserted into a CP-696/PDR-75 reader, which then displays the cumulative neutron and gamma dose. The reader is issued at the company level and the dosimeters are issued to all combat, combat support, and combat service support personnel. The reader can be powered by a BA-5590 lithium battery, vehicle battery, or external power supply via adapter cables provided.





### AN/PDR-77 Radiac Set

The AN/PDR-77 Radiac Set is a set of portable radiation detection equipment for detecting alpha, beta, gamma, and x-ray radiation. The set consists of a radiacmeter to which one of three radiation probes can be attached for measuring particular types of radiation. The probes are part of the set. The set includes accessories and basic test and repair parts for unit maintenance including a carrying pouch with shoulder straps capable of holding the radiacmeter, alpha probe, and beta/gamma probe for field use. The entire set is contained in a carrying case (large briefcase) for easy portability and storage.



### AN/UDR-13 Pocket RADIAC (Platoon Radiac) - Production (FUE FY98)



The AN/UDR-13 Pocket RADIAC is a compact, hand-held, tactical device capable of measuring the gamma dose-rate and gamma and neutron cumulative dose in a battlefield environment. Its pocket size permits convenient use by troops on foot. Alarm pre-sets are provided for both the dose-rate and total dose modes. A push-button pad enables mode selection and functional control. Data readout is by liquid crystal display. It will replace the obsolete IM-93 quartz fiber dosimeter.

### Multi-Function Radiation (MFR) Detector -Production

This program will develop improved radiation detection equipment to replace the current suite of logistically unsupportable assets. Present detectors (PAC-1S, AN/PDR-43 and AN/PDR-56F) have exceeded maintainability standards. Original manufacturers have either discontinued production or are no longer in business. An improved capability is required to support both wartime and peacetime nuclear accident response operations. A production contract was awarded in March 1995. First deliveries were made in 1997.

### ADM-300A Multifunction Survey Meter

The ADM300A is a battery-operated, self-diagnostic, multiple functional instrument. It is used alone to locate and measure low and high intensity radioactivity in the form of gamma rays or beta particles. It is used with external probes to locate and measure alpha, beta, gamma, and x-rays, and neutron radiation.



## SECTION 2. RDTE ITEMS

### AUTOMATIC DETECTORS AND MONITORS

#### Agent Water Monitors

*The Joint Service Chemical Biological Agent Water Monitor is a cooperative RDTE effort, chartered to develop a detection system which will detect chemical and biological agents in water. The detector will feature multi-agent capabilities, and operate automatically, improving both ease and response time of existing system. The project will accommodate the four services' requirements for the following:*

*In-line CB Detector (IL CBDWS)  
Chemical Agent Water Monitor (CAWM)  
CB Agent Water Monitor (CBAWM)*

#### Rationale:

- Joint Army, Air Force, and Marine Corps requirement
- Navy interest

#### Key Requirements:

- Detect and identify chemical agents and agents of biological origin in water
- Perform monitoring automatically with continuous and batch sampling capabilities
- Easy to operate and support in forward areas, austere environments, and limited lighting

#### Description:

The Agent Water system will improve current water monitoring and purifying capabilities. It will automatically detect CB agents at or below harmful levels in water and not false alarm to common interferents. The system will be compact, man-portable and easy to use, and be decontaminated to a negligible risk level.

#### Joint Chemical Agent Detector (JCAD)

*The JCAD is a fully cooperative RDTE effort, chartered to develop a chemical agent detector for a variety of mission requirements and service platforms. The detector will provide warfighters near-real time information on the presence of chemical agents so that miosis or more severe effects can be avoided and not subvert the mission. The project will accommodate the four services' requirements for the following:*

*Individual Soldier Detector (ISD)  
Special Operation Force Chemical Agent Detector (SOF-CAS)  
Individual Vapor Detector (IVD)  
Aircraft Interior Detector (AIDET)  
Shipboard Chemical Agent Monitor Portable (SCAMP)  
CW Interior Compartment System (CWICS)  
Improved Chemical Detection System (ICDS)*

Rationale:

- Joint Army, Navy, Air Force, and Marine Corps requirement

Key Requirements:

- Small, lightweight detector capable of detecting presence of chemical agent vapors
- Capable of de-warning, allowing for rapid reduction of protective postures
- Detect, identify, quantify, and warn of presence of even low levels of nerve, blister, and blood agents in vapor form in aircraft and shipboard interiors
- Operated/maintained by ship's force; operate in a shipboard environment

Description:



JCAD will provide a detector or a network of detectors capable of automatically detecting, identifying, and quantifying chemical agents (nerve, blister, and blood) inside aircraft and shipboard interiors. The device must be sufficiently sensitive to warn aircrews before accumulation, over the entire mission, of levels of agent that may cause miosis or more severe effects. JCAD will also provide handheld monitoring capabilities, protecting the individual soldier, sailor, airman, and marine through the use of pocket-sized detection and alarm.



### Shipboard Automatic Liquid Agent Detector (SALAD)

Rationale:

- Navy service-unique requirement

Key Requirements:

- Automatic detection of liquid chemical agents
- Operated/maintained by ship's force
- Operate in a shipboard environment and detect while the ship is underway

Description:



SALAD is an exterior, liquid agent point detection and monitoring system that will detect and alarm in the presence of liquid nerve and blister agents. The SALAD EDM consists of a detector unit that uses chemically treated paper, optical scanners, a central processing unit, and alarms (visual and audible) on the bridge and Damage Control Central. Production units will be contracted for based on a performance specification. These units may use detection technologies other than that selected for the EDM.

## BIOLOGICAL LONG LINE SOURCE RELEASE AND POINT DETECTION

*Biological Point Detection is a fully cooperative acquisition effort chartered to develop new biological point detectors and detection systems for quad-services. The BIDS P3I effort will encompass development of an integrated system as well as several stand-alone biological detectors. In addition, a Joint Biological Point Detection System (JBPDS) is under development. JBPDS will be a system that can stand alone, or be used in a suite of systems.*

### Biological Integrated Detection System (BIDS) -P3I

Rationale:

- Army service-unique requirement
- Navy, Air Force, and Marine Corps interest in BIDS' sub-components

Key Requirements:

- Detect and identify 5 to 25 agent-containing particles/liter of air (ACPLA) in the 2–10 micron range in 15–30 minutes
- Provide agent detection and simultaneous identification of 8 agents
- Provide collective protection with environmental controls
- Knowledge-based system to process detector information
- FM/HF radios to communicate
- Automatically identify biological pathogens and toxins
- Reject common battlefield interferents and be re-programmable to detect new agents

- Be data-linked with a centralized hazard information data collection center
- Respond to agent vapors or aerosols
- Possess modules to accommodate future advances in technology and CB threat

**Description:**

BIDS uses a multiple technology approach, both developmental and off-the-shelf materiel, to detect and presumptively identify biological agents with maximum accuracy. The BIDS P<sup>3</sup>I system will integrate the CB Mass Spectrometer (CBMS) and the Biological Detector (BD) as sub-components.

The Biological Detector is an antibody-based device capable of identifying specific biological agents. It consists of electronics processing equipment, fluid processing modules, reservoirs for antibody reagents, and a light addressable potentiometric sensor to provide biological agent identification. The total processing time, from insertion of sample to data readout, will be approximately 15 minutes at threshold concentrations. The biodetector includes an operator display which will provide identification and relative concentration of the biological agent detected. Built-in tests will also be provided to identify system malfunctions.



CBMS detects and characterizes all known chemical and biological threat agents. It continuously and automatically detects threat agents via a mass analyzer chassis, a biological aerosol sampling probe, a surface sampling probe and sample identification device. The mass analyzer chassis houses the mass analyzer, pumps, control electronics, and computers. With the aerosol probe attached, the CBMS detects biological agent aerosols and chemical agents as aerosols and/or vapors in the air. With the ground probe attached, the CBMS detects chemical agents whether they exist as airborne vapors or aerosols, or as liquid droplets on surfaces. The CBMS will replace the MM1 and be mounted within the NBC Recon System to search for areas of CB agent contamination.

aerosols, or as liquid droplets on surfaces. The CBMS will replace the MM1 and be mounted within the NBC Recon System to search for areas of CB agent contamination.

**Air Base/Port Biological Detection (Portal Shield)  
Advanced Concept Technology Demonstration (ACTD)**

**Rationale:**

- Requirements identified by the Commander-in-Chief Central Command (CINCCENT) and Commander-in-Chief Pacific Command (CINCPAC)

**Key Requirements:**

- Field interim systems to sponsoring CINCs that provides rapid, automated biological attack detection, identification and warning (in less than 20 minutes) to high value fixed sites (*e.g.*, ports and airfields)
- Automated “smart” sensor network
- Chemical sensor interfaces for automated biological and chemical network warning and reporting
- In addition to the biological detection system itself, provide the following “leave-behinds” or “residuals” to the fixed sites: an integrated command and control system

to assist base personnel in rapid assessment, warning and dissemination of attack data; unmasking procedures; contamination detection sampling kits, tested tactics, techniques and procedures.

- Demonstrate the military utility of a smart sensor network and exercise operational concepts that may both fill the CINCs immediate needs, and provide valuable “lessons learned” for future systems

Description:

While the BIDS and Long Range Biological Detection System (LR-BSDS) programs have made significant advances towards mitigating the effects of the worst case biological attack scenario (long line source releases—*e.g.*, an aircraft spraying agent along a course tens of kilometers long), we still have potential vulnerabilities in protecting those high value fixed sites that will play critical roles in force projection operations. Ports and air-bases, by nature of their commonly known locations and high density of personnel, make lucrative targets for point source releases (*e.g.*, theater ballistic missiles, covert spraying by land and sea vehicles, or even man-portable disseminators). JPO-BD proposed taking available technologies and, through an ACTD, provide a limited number of biological detection systems to warfighting CINCs. The concept has been to build an intelligent network of sensors based on the Navy’s IBAD components, but add to each sensor an automated immunoassay ticket reader for near real time identification of BW agents, location and meteorology modules and “smart” network algorithms to reduce use of consumables and lower false positive rates. The detector network is able to detect significant changes in background aerosol concentrations in near real time, and can also (15-25 minutes) provide the operator located in the central command post a presumptive identification of the BW agent. Site personnel are then able to retrieve samples of the aerosol from the sensors for confirmatory identification of the BW agent. The ACTD will not only provide detection and identification hardware and procedures, it will also provide leave-behinds for post attack actions, such as: contamination detection sampling kits that can provide BW identification of contaminated surfaces such as missile fragments, in 15 minutes; and Enzyme Linked ImmunoSorbent Assay (ELISA) kits for a “gold standard” identification capability. User acceptance testing was completed in September 1997. The prototype Mark II network was successfully deployed to Kuwait in support of Operation Desert Thunder in February 1998. Full scale deployment of the ACTD to CENTCOM and PACOM will begin in 2QFY99. The Joint Chiefs of Staff (JCS) directed the production of additional Portal Shield networks starting in FY99 and funded their fabrication and support through FY02.



## Joint Biological Point Detection System (JBPDS)

### Rationale:

- Joint Army, Navy, Air Force, and Marine Corps requirement

### Key Requirements:

- Automatically detect, identify and warn of the presence of aerosolized biological warfare agents at levels of sensitivity, speed and reliability equal to or better than currently fielded detection systems
- Provide a common suite of biological detection equipment that can be applied to all four services' designated platforms
- Provide a man-portable version (Air Force and Marine Corps)
- Be operable while on the move (Army and Navy)

### Description:

JBPDS is the joint biological point detection system. This developmental system will replace all existing biological detection systems (BIDS, IBAD and Air Base/Port ACTD), and provide biological detection capabilities throughout the services and throughout the battlespace. The common biological detection suite will consist of four functionalities: *trigger* (detects a significant change in the ambient aerosol in real time), *collector* (collects samples of the suspect aerosol for analysis by the JBPDS, and for confirmatory analysis by supporting laboratories in the Communications Zone (COMMZ) and CONUS), *detector* (able to broadly categorize the contents of the aerosol and lend confidence to the detection process; *e.g.*, biological material in the aerosol or not, bacteriological, spore, protein, *etc.*), and *identification* (provides presumptive identification of the suspect BW agent and increases confidence in the detection process). These four functionalities will be integrated to allow fully automatic operation, and warning of a positive BW detection. The JBPDS program consists of two phases (Block I and Block II) to allow the fastest possible fielding of a joint biological detection system, while at the same time preparing to take advantage of the rapid advances taking place in the biological detection/identification, information processing and engineering sciences. JPO-BD awarded an Engineering and Manufacturing Development (EMD) contract in FY97 for the development of Block I JBPDS prototypes for all four services. Production is anticipated to start in 4QFY00, with first unit equipped in March 2002. This joint acquisition strategy will allow for significant economies throughout the RDA process by eliminating duplicative efforts among the services, and greater logistic supportability in joint operations as each service will be able to support the other services' JBPDSs.

## Critical Reagents Program (CRP)

### Rationale:

- Supports all Services biological detection programs

### Key Requirements:

- Provide Total Life Cycle Management for the critical reagents (antibodies, and gene probes and primers) that are necessary to the operation of nearly all DoD biological detection systems.
- Ensure best quality reagents are available in time and in adequate quantities.
- Ensure adequate security and surge capability of critical reagents.
- Put in place a production program for the Handheld Immunochromatographic Assays (HHAs) that are critical to several bio detection programs.

### Description:

The Critical Reagents Program will ensure the quality and availability of reagents that are critical to the successful development, test and operation of biological warfare detection systems and medical biological products managed by JPO-BD. The program will maintain an R&D effort to ensure the best possible reagents are available for use against both current and future threats. The program will institute a program wide quality assurance program and address relevant security issues. During the first four years of the program, the CRP will require the greatest level of effort and funding to ensure required reagents are available to support fielded systems (BIDS NDI, P3I and IBAD), and developmental systems (JBPDS Block I and Portal Shield ACTD). The next three years require the development of 12 additional reagents to support the development and fielding of the JBPDS Block II. Outlying years will focus on the development of reagents to detect new and emerging threats and procurement of more effective reagents to replace older stocks.

## STAND-OFF DETECTION AND REMOTE/EARLY WARNING

### Joint Service Lightweight Standoff Chemical Agent Detector (JSLSCAD)

*The JSLSCAD is a fully coordinated joint service RDTE program, chartered to develop a lightweight standoff chemical detector for the quad-services. The JSLSCAD will utilize a passive infrared sensor with 360° scanning to satisfy requirements for:*

*Lightweight Standoff Chemical Agent Detector (LSCAD)  
M21 Moving Background  
Chemical Agent Remote Detection System (CARDS)  
Stand-off Detector for Armored System Modernization (SD/ASM)*

### Rationale:

- Joint Army, Navy, Air Force, and Marine Corps requirement. (Army is lead Service)

### Key Requirements:

- Automatically detect nerve, blister, and blood agents at a distance up to 5 km
- Lightweight and employed from manned and unmanned systems

- Capable of being data-linked with centralized hazard information data collection center
- Capable of remote operations; aerial and on-the-move operation

**Description:**

JSLSCAD will be capable of scanning 360° x 60°, and automatically detecting nerve or blister agents at a distance up to 5 km. The system will be light, compact and operate from a stationary position or on-the-move. The JSLSCAD Michelson interferometer employs a passive infrared system that will detect presence of chemical agents by completing a spectral analysis of target vapor agent chemical clouds. JSLSCAD is envisioned for employment on various platforms and in various roles, including fixed site defense, unmanned aerial vehicles, tanks and other vehicles, and on board ships.



**Joint Service Warning and Identification LIDAR Detector (JSWILD)**

*JSWILD is a joint effort chartered to develop a chemical warning and identification system for the quad-services. JSWILD will utilize an active LIDAR sensor to perform rapid agent identification and ranging to satisfy requirement for:*

*Laser Stand-Off Chemical Detector (LSCD)  
Area Detection System (ADS)  
Stand-off Detector (SD)  
CB Stand-off Detector (CBSD)*

**Rationale:**

- Army and Air Force interest

**Key Requirements:**

- Automatically detect, range, and map CW agents at distances of up to 20 km
- Scan atmosphere and terrain to detect chemical vapors and airborne liquids and particles
- Provide stand-off capability for both fixed site and reconnaissance
- Provide rapid agent concentration mapping

**Description:**

JSWILD will be a lightweight, vehicle-mountable, contamination monitoring system, which detects and quantifies all types of chemical agent contamination (including agent rain, vapors, and aerosols) in a stand-off mode from a distance of 20 kilometers (km). In addition, JSWILD will provide similar but shorter range (1–5 km) capabilities in biological standoff detection as the Long Range Biological Standoff Detection System. The JSWILD



will operate from fixed sites and ground vehicles. The system has distance-ranging and contamination-mapping capabilities and transmits this information to a battlefield information network.

### **Biological Remote/Early Warning**

*The Army's Long Range Biological Standoff Detection System (LR-BSDS) is a legacy system that is being incorporated into what is envisioned to be a family of early warning systems*

*The Joint Biological Remote Early Warning System (JBREWS) program is intended to give the warfighting commander a significantly shortened decision cycle regarding biological attacks; that is, the commander will see and be able to react to a biological attack much faster, thereby allowing many more personnel to take protective measures before they become exposed to the biological warfare agents. This means that fewer people will become casualties, and fewer people will have to take post-attack medical treatments.*

### **Long Range Biological Standoff Detection System (LR-BSDS) P3I**

#### **Rationale:**

- Army requirement
- Navy and Air Force interest

#### **Key Requirements:**

- Stand-off detection of aerosol clouds out to a range of at least 50 km
- Provides relative concentration, range, location, and tracking of suspect aerosol clouds
- Automated cloud discrimination
- Operating crew reduced to one operator
- UH-60 helicopter-mounted

#### **Description:**

LRBSDS uses infrared light detection and ranging (IR-LIDAR) technology to detect, range and track aerosol clouds that are indicative of a BW attack; the LR-BSDS cannot discriminate biological from non-biological clouds. The system, which is approximately 1,240 pounds and 2.3 cubic meters, has three major components: a diode pulsed IR laser transmitter operating at IR wavelengths; a receiver and telescope; and an information processor and display. This program, like BIDS, has been designed in two phases; an NDI phase designed to rapidly field an interim capability, and a pre-planned product improvement (P3I) phase. Three NDI LR-BSDSs have already been fielded to the 310<sup>th</sup> Chemical Company (USAR). A total of 10 LR-BSDS P3I systems will be procured from FY00 to FY02 (3 per company with 1 training system). The NDI system is able to detect and track man-made aerosols out to 30 km, but is non-eyesafe out to about 2.5 km. The P3I LR-BSDS will be eyesafe, will have a longer operating range (50 km), and will be easier to operate. The first P3I LR-BSDSs will be fielded to the 7<sup>th</sup> Chemical Company (Biological Detection) in 1QFY01.

*The Joint Program Office for Biological Defense is leveraging the benefits of the ACTD program to greatly accelerate the development of the next generation of remote/early warning systems (i.e., systems other than the LR-BSDS). This new generation of detectors is referred to as the Joint Biological Remote/Early Warning System (JBREWS). JPO-BD is managing a JBREWS ACTD that will address selected CINCs' needs, and will better refine our requirements and concepts regarding remote/early warning systems.*

### Joint Biological Remote Early Warning System (JBREWS)

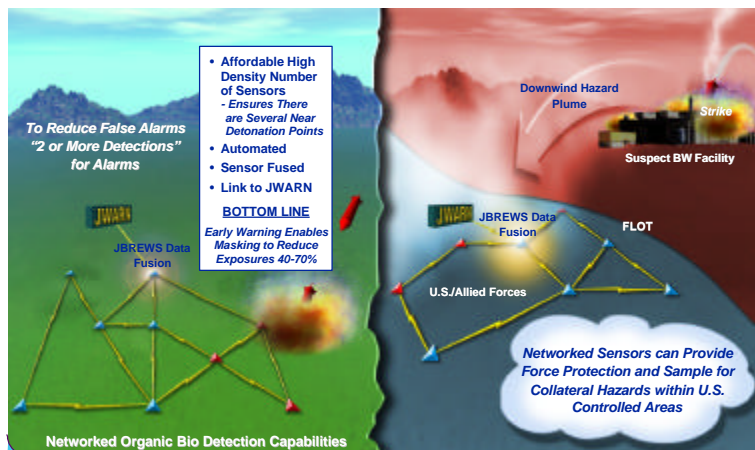
#### Rationale:

- CENTCOM and EUCOM requirement (ACTD)
- All services interest (ACTD and objective system)

#### Key Requirements:

- JPO-BD is sponsoring a series of concept studies, including a Study Advisory Group (SAG) composed of CINC, Service, and Joint NBC Defense Board representatives. This cooperative effort will define the requirements for the JBREWS ACTD
- The ACTD formally started in FY98, with fielding of ACTD systems to selected CINCs around FY01
- Lessons learned from the JBREWS ACTD will assist the SAG in developing/refining its requirements document for the JBREWS objective system
- JBREWS objective system is expected to start fielding around FY03

#### Description:



JBREWS is planned to become a “system of systems.” That is, it may have legacy systems—BIDS, JBPDS, and standoff LIDAR systems such as the LR-BSDS—integrated with short range biological standoff detection systems (SR-BSDS) and dense arrays of miniaturized, rugged point detectors into a distributed network of sensors. The miniature sensors

will possess only one or two of the functionalities that the much more robust JBPDS will have. The point detectors may be employed in a variety of ways: carried on vehicles, emplaced by hand around unit/site perimeters, remotely emplaced by aircraft, or possibly even delivered by artillery or rocket systems to project the sensors into contested or enemy controlled areas. The systems need to be networked to provide the greatest confidence of accurate detection and rapid warning. They will need to be deployed and distributed widely and in high numbers to ensure point releases are not missed.

## NBC RECONNAISSANCE

### Joint Service NBC Reconnaissance System (JSNBCRS)

*The Joint Service NBC Reconnaissance program is a coordinated Army and Marine Corps effort which will yield improved reconnaissance capabilities for both heavy and lightweight vehicle platforms. It will satisfy requirements for:*

*M93A1 NBC Reconnaissance System (NBCRS) Production  
M93A1 P3I Block II  
Light NBC Reconnaissance System (LNBCRS)  
Lightweight Reconnaissance System (LWRS)*

#### Rationale:

- Joint Army, Air Force, and Marine Corps Requirement

#### Key Requirements:

- Armored vehicle with over-pressure collective protection and macro cooling
- Chemical agent stand-off and point detectors and monitors
- Radiation detector and monitor
- Integrate central data processor with all detectors and monitors; navigation and communications system; jam resistant communications system; and meteorological sensing system
- Integration of advanced NBC detection and analysis equipment suited for Marine Air-Ground Task Force (MAGTF) operations (LNBCRS)
- Standard Marine Corps host vehicle, transportable by C-130, CH-53E, and LCAV-30 (LNBCRS)

#### Description:



The LNBCRS (shown) will provide a premiere vehicle for accurate, rapid NBC combat hazard information by verifying the absence of, finding, mapping, and marking radiological, biological, and chemical hazards. The LNBCRS will be an integration of advanced NBC detection and analysis equipment suited for Marine Air-Ground Team Force expeditionary operations and Army rapid deployment/light operations.

## WARNING AND REPORTING

### Joint Service Warning and Reporting Network (JWARN) (FUE FY 99)

#### Rationale:

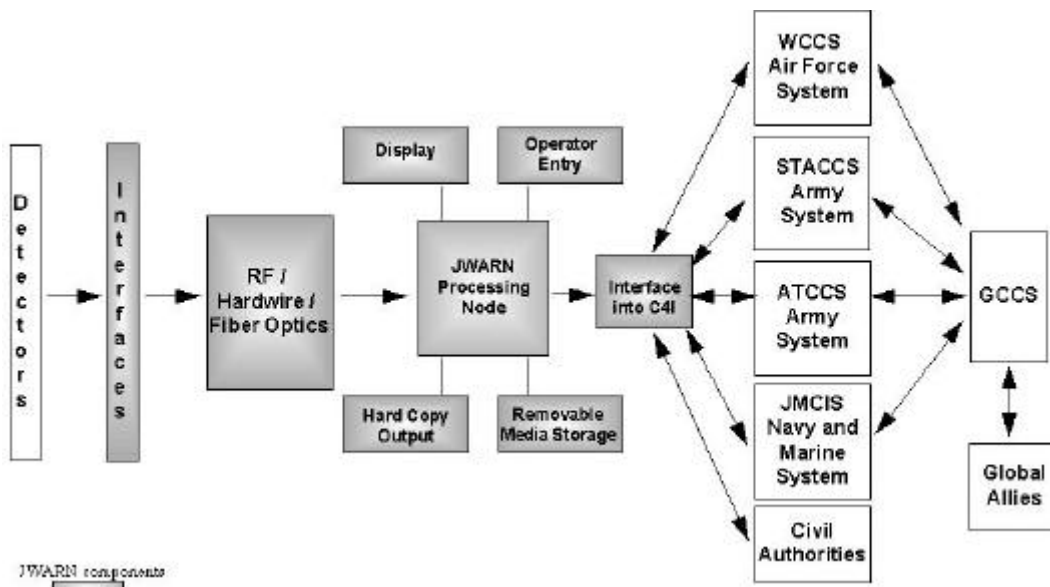
- Army, Navy, Air Force, and Marine Corps requirement

#### Key Requirements:

- Capable of interfacing with all NBC detectors and sensors
- Capable of interoperability with all service command and control systems
- Capable of generating NBC reports
- Capable of automatic transmission of NBC alarm and data
- Capable of vehicle operation

#### Description:

JWARN will provide the Joint Force a comprehensive analysis and response capability to minimize the effects of hostile NBC attacks or accidents/incidents. It will provide the operational capability to employ NBC warning technology that will collect, analyze, identify, locate, report and disseminate NBC threat and hazard information. JWARN will be compatible and integrated with Joint Service C<sup>4</sup>I systems. JWARN will be located in command and control centers at the appropriate level defined in Service-specific annexes and employed by NBC defense specialists and other designated personnel. It will transfer data automatically from and to the actual detector/sensor and provide commanders with analyzed data for decisions for disseminating warnings to the lowest echelons on the battlefield. It will provide additional data processing, production of plans and reports, and access to specific NBC information to improve the efficiency of NBC personnel assets.





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